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Abstract

Two studies examined children's confidence judgments in the accuracy of their memories after repeated experience of an event. Children aged 5- to 6-years took part in an event once or four times, were provided with misinformation either shortly after (Study 1) or a while after (Study 2), and interviewed with yes/no recognition questions three months later. Children in the repeated-experience conditions were highly confident of their accurate responses to questions about items that were identical rather than variable across occurrences, and this discrimination was best at the shorter delay. The results show that children were able to metacognitively monitor the accuracy of their responses to qualitatively different kinds of details, and indicate that age is not the only determinant of metacognitive awareness after being misled. Rather, the nature of event representations must also be considered.

Evidence of metacognitive awareness in young children who have experienced a repeated event

Many children involved in child abuse investigations allege that they have been abused on multiple occasions. Children's suggestibility following repeated experiences is known to follow different patterns than children's suggestibility when interviewed about an event that happened just one time (see Roberts & Powell, 2001, for a review). As alleged victims of repeated abuse typically report some details that are identical and some that vary in each individual instance of abuse, it is important to study how their memories differ for both kinds of details. It is now well established that children are highly resistant to misleading suggestions about items that do not vary across event occurrences but have poorer memories of items that do vary (e.g., if the color of clothing is different each time; Connolly & Lindsay, 2001; Powell, Roberts, Ceci, & Hembrooke, 1999). Powell et al. (1999) suggested that children may have heightened confidence in memories of items that do not vary compared to their confidence in their memories of variable items, though this was not tested directly. Thus, in the two studies reported here, direct measurements of children's confidence in their memories of items that did and did not vary across a series of repeated occurrences were obtained after children had been misled.

Understanding children's confidence after repeated experiences is important for at least two reasons. First, confidence in memory is often treated as an indicator of the accuracy of memory. Confidence is the single most important factor affecting jurors' beliefs about the credibility of eyewitness identifications (e.g., Lindsay, 1994; Penrod & Cutler, 1995), even though confidence-accuracy relations are typically weak to moderate (Wells, 1993). Specifically, the relation is weak when witnesses fail to make an identification and moderate when they do (Sporer, Penrod, Read, & Cutler, 1995). Second, children's discrimination in the accuracy of their memories indicates metacognitive awareness (Roebers, 2002), a factor that may underlie the success of techniques to train children to monitor their memories and edit out false reports (e.g., Giles, Gopnik, & Heyman, 2002; Ghetti, 2003; Roebers & Howie, 2003; Thierry & Spence, 2002). Indeed, Koriat and Goldsmith (1996) challenged child eyewitness researchers to consider how metamemory processes work in conjunction with memory processes to fully understand children's suggestibility, though researchers have only recently begun to treat metamemory as an intrinsic aspect of children's eyewitness memory.

Children who have participated repeatedly in similar events can recall and recognize event items accurately if those items never varied across the series of occurrences (hereafter called 'fixed items'; e.g., Connolly & Lindsay, 2001; Powell et al., 1999). Of specific interest is the finding that children are highly resistant to misleading suggestions about fixed items. In the study reported by Powell et al. (Experiment 1), for example, children took part in six occurrences of a classroom activity and were misled either three days or three weeks later about 12 fixed items in the occurrences (e.g., suggesting that the puppet was called 'Kip', when it was actually 'Boo'). When asked the following day to recall the instantiation that had occurred in the last occurrence (e.g., 'What was the puppet's name?"), children were able to accurately recall 88% of the items even though they had been presented with misleading information about these items. Although 3- to 5-year-olds were more suggestible than 6- to 8-year-olds when they had taken part in just one occurrence, these age differences in suggestibility were eliminated when the children had taken part in the activity repeatedly.

In Powell et al.'s (1999, Experiment 1) study, children were highly confused about items that varied each time (hereafter called 'variable items', e.g., children completed a puzzle of a clown driving a car, playing a banjo, eating cakes, waving a wand, balancing, and juggling in

Occurrences 1-6, respectively). Children tended to report instantiations from other occurrences when asked about the instantiation in the last occurrence (e.g., inaccurately reporting that the puzzle was of a clown driving a car). Despite this confusion, children with repeated experience did not accept false suggestions any more than those who had experienced the event just one time did; in fact, children with repeated experience of the event were *less* likely to report the suggested instantiation than were children in the single-experience condition. Powell et al. suggested several reasons for the surprising finding that repetition decreased suggestibility for variable items. First, children who had experienced the event repeatedly had a greater pool of instantiations to draw from (6 experienced instantiations) and so could easily substitute a remembered instantiation if they did not remember the target instantiation. Second, although the instantiations varied during each occurrence, the presentation of the item could reinstate memories of the other instantiations thus increasing the chances that an experienced instantiation was reported rather than the suggested instantiation (Marche, 1999; Roberts, Lamb, & Sternberg, 1999). Third, the predictability of the highly similar occurrences could have led children to anticipate the instantiations and this may have enhanced encoding of the instantiations (Foley, Durso, Wilder, & Friedman, 1991). Finally, children's heightened certainty in their memories of fixed items may have lowered their confidence in the interviewer's suggestions about variable items thus helping children resist the suggestions. It is the final suggestion (that children are highly confident of their memories of fixed items) that we investigated in the current study.

In contrast to Powell et al.'s (1999, Experiment 1) results, more recent studies have reported that children with repeated experience are as suggestible or more suggestible than children with a single experience when questioned about variable items (e.g., Connolly & Lindsay, 2001; Powell et al., 1999 [Experiment 2], 2000; Powell & Roberts, 2002). The differences can be traced to two manipulations: First, repetition does not increase resistance to suggestions about variable items when the suggestions are explicitly linked to the target event but only when the misinformation is suggested as occurring at any point in the series (Powell et al., 2000); second, repetition does not increase resistance to suggestions about variable items when memories are elicited with recognition questions (Powell & Roberts, 2002). However, in all of the studies that have compared children's memories of fixed and variable items, resistance to suggestibility is enhanced for fixed items relative to variable items thus children's heightened accuracy for fixed items is a robust and consistent finding (Connolly & Lindsay, 2001; Powell et al., 1999; Roberts & Powell, 2003). Thus, investigating whether confidence judgments are associated with improved accuracy for fixed items after repeated experience would provide useful information about the development of children's metacognitive awareness and its relation to suggestibility, and may help clarify some of the differences reported in the repeated events literature.

Confidence judgments about memories can be used as the basis for decisions about what information to report when the need for accuracy has been emphasized (Koriat & Goldsmith, 1996). Forensic interviews and court testimony provide two such examples of when accuracy is crucial. Eyewitnesses may choose to withhold reports of details whose accuracy they are uncertain of, while reporting memories that they confidently believe to be accurate. Although adults frequently show overconfidence in the accuracy of their memories (e.g., Koriat, Lichtenstein, & Fischhoff, 1980), they are able to discriminate between their memories reporting greater confidence when they are correct than when they are incorrect (Robinson, Johnson, & Robertson, 2000; Roebers & Howie, 2003). After being misled, however, adults show reduced discrimination in their confidence of correct and incorrect responses (Loftus, Donders, Hoffman, & Schooler, 1989) though they show more discrimination than do children (Roebers, 2002).

Children are especially prone to being overconfident in their responses and do not show discrimination between correct and incorrect responses until about age 8 (Pressley, Levin, Ghatala, & Ahmed, 1987). Eight- and 10-year-old children do not discriminate, however, when asked misleading questions but only when questions probe details that were present during staged events (e.g., Roebers, 2002; Roebers & Howie, 2003). Given that Roebers and Howie found that discrimination was also related to accuracy, these findings show that a lack of metacognitive awareness is associated with suggestibility effects in children. If children are unaware of the accuracy of their memories, then they may be more willing to report erroneous information such as false suggestions about what happened. The use of other kinds of metacognitive monitoring to edit false reports has been observed more commonly in children aged 7-years and older than younger children (Ghetti, 2003; Poole & Lindsay, 2001, 2002). Thus, there is a growing body of research showing that developmental differences in metacognitive monitoring is related to children's suggestibility.

The developmental differences in children's discrimination of confidence in their memories reflects their metacognitive awareness after being misled after a *single* presentation of the to-be-remembered material. Developmental differences in suggestibility after *repeated* experiences of a similar event, however, are attenuated (recall that Powell et al. [1999] found that 3- to 5-year-olds were as resistant to suggestions about fixed items as were the 6- to 8-year-olds in the study). If metacognitive monitoring (in this case, in the form of confidence in memory accuracy) partly drives suggestibility effects, we would expect to see such metacognitive discrimination at younger ages than previously reported provided that the younger children had participated repeatedly in an event. If such metacognitive discrimination is not shown by younger children (e.g., if such metacognition is conceptually too advanced at this age), then we could conclude that metacognitive awareness is not driving the suggestibility effects in this age group and thus more profitably study other individual difference factors that reduced suggestibility in these studies.

In the current investigation, children participated once or four times in scripted activities, were presented with misleading information, and their memories of the only or last occurrence of the activities was tested. The children provided confidence judgments in the accuracy of their responses to the memory questions. Two studies were run and each study comprised an identical design but differed only in when the misinformation was presented. In Study 1, the misinformation was presented shortly after the event(s); in Study 2, it was presented after fairly long delays. We expected that children with repeated experience would be more confident in the accuracy of their responses to questions about fixed than variable items, and more confident in their responses about fixed items than children who participated in the event just once.

Method

Participants

In total, 65 children aged 5- to 6-years participated in the research. In Study 1 (shorter delay), there were 33 children aged between 60 and 73 months (*M* = 5 years, 9 months; *SD* = 3.62); in Study 2 (longer delay), there were 32 children aged between 61 and 75 months (*M* = 5 years, 8 months; *SD* = 3.75). The children were recruited from schools in the Melbourne metropolitan area and their parents gave informed consent. There were approximately equal numbers of boys and girls in the single- and repeated-experience conditions in each study.

Materials

The to-be-remembered event was a scripted 30-minute activity that was modeled on that used by Powell et al. (1999) and labelled for the children as the "Deakin Activities". The activity comprised 16 target details embedded in several activities: physical exercise, listening to a story, doing a puzzle, getting a surprise, and relaxing. For children in the repeated-experience conditions, eight items were exactly the same during each occurrence ('fixed' items), and eight items varied each time ('variable' items). To designate the target occurrence, children in the single-experience conditions wore a badge during their only experience of the activities, and children in the repeated-experience conditions wore the badge during the fourth and final occurrence of the activities.

Misinformation was provided in two interviews that occurred prior to the target interview. In the first interview, eight details from the target event (4 fixed, 4 variable) were accurately described and eight (4 fixed, 4 variable) were inaccurately described. For example, the interviewer could inaccurately say "I heard there was a puzzle of a clown *driving a car with a flat tire*. Who put the puzzle together that day?" to a child who had never seen such a puzzle (but had seen other puzzles). In the second interview, both accurate and inaccurate descriptions of the 16 target items were probed using two sets of 16 yes/no questions (e.g., for the above example, a Set 1 question might be "Was there a puzzle of a clown bicycling, when you wore the badge?" [true item], and the Set 2 question would be "Was there a puzzle of a clown driving a car with a flat tire, when you wore the badge?" [false item]).

Recognition of the original items from the target event and confidence ratings were measured in the target interview. For each of the 16 target items, children were first asked a forced-choice recognition question (e.g., "Did you see a puzzle of a clown bicycling the day you wore the badge, or wasn't there a puzzle of a clown bicycling that day?"). Children were asked to make their responses explicit, for example, by narrative responses such as "there wasn't a clown puzzle that day", and all children were able to do this. The interviewer then affirmed the response and asked the children to indicate their certainty in the correctness of their response (e.g., "You saw/didn't see a puzzle of a clown bicycling the day you wore the badge. Are you really sure that you saw/didn't see a puzzle of a clown bicycling that day or did you guess a bit?"). Both accurate and inaccurate descriptions of the 16 items were probed, thus, two counterbalanced sets of 16 questions were administered. All children responded with "see" or "guess", thus no responses were excluded.

The items were counterbalanced in the event, misinformation interviews, and target interview so that each item served equally often as a fixed or variable item in the event, and each item was described both accurately and inaccurately (see Powell et al., 1999, for a full description of the counterbalancing procedure). The order of 'sure' and 'guess' options in the target interview were also counterbalanced.

Procedure

The activity was carried out in the children's schools and was administered by a trained research assistant (RA) to groups of 20-28 children (though only children whose parents gave informed consent participated in the interviews). Teachers were instructed not to talk with the children about the activities or to inform them that they would later be interviewed.

In Study 1 (shorter delay), the misinformation interviews took place three and four days, respectively, after the target event; in Study 2, the respective delays were 21 and 21 days. In both studies, the target interview took place three months after the second misinformation interview and was administered by a different RA to the ones who did the misinformation interviews. After a brief period of rapport building, the interviewer explained that she had heard that children did the Deakin activities and wore a badge (to orient them to the target occurrence). The RA then explained that she was not there the day the children wore the badge but needed to know what happened. The first set of 16 question pairs (recognition question followed by the confidence question) was then asked in random order, followed by the second set, also in random order.

Responses to the recognition questions were coded as ‘correct’ if children (accurately) said “yes” to questions about true items, or “no” to questions about false items. The confidence ratings were used to calculate proportional scores separately for questions probing the true and false descriptions of fixed and variable items. For example, the number of ‘sure’ ratings given to questions about fixed-true items was divided by the number of correct responses to questions about fixed-true items. Thus a high score represents a high level of certainty in correct recognition of fixed items. Similarly, the number of ‘sure’ ratings given to questions about fixed-false items was divided by the number of correct responses to questions about fixed-false items. Thus, a high score represents a high level of certainty that the items were never presented during the target event. Similar proportional scores were calculated for responses to questions about variable-true and variable-false items.

Results

First, we present responses to the recognition questions. These analyses were performed to ensure that the usual effects of enhanced memory of fixed items and resistance to suggestions about fixed items relative to variable items was observed in the responses of children in the repeated-experience condition (but not the single-experience condition). Next, we present the analyses on the certainty ratings that children gave for their responses to questions about fixed and variable items. As the designs of Studies 1 and 2 were identical except for the timing of the misinformation sessions, we present the analyses for both studies below.

Recognition questions

The number of correct responses to recognition questions given by children in Study 1 (shorter delay) were entered into a 2 (Experience: single, repeated) x 2 (Item: fixed, variable) x 2 (Suggestion: true, false) analysis of variance (ANOVA) with the last two factors within-subjects. There was a main effect of item, $F(1, 27) = 11.17$, $p < .01$, $\eta^2 = .29$, and this was qualified by an interaction with experience, $F(1, 27) = 6.84$, $p < .02$, $\eta^2 = .20$. Specifically, planned comparisons showed that children in the repeated-experience condition were more accurate when answering questions about fixed items (*M* = 14.62, *SD* = 0.96) than variable items (*M* = 11.54, *SD* = 2.57), $t(12) = 3.83$, $p < .01$. As expected, however, there was no difference in responses to fixed and variable items by children in the single-experience condition (*M*s = 13.13, 12.75 and *SD*s = 1.78, 2.78 for the fixed and variable items, respectively), $t(15) < 1.00$, *ns*. There was also a main effect of suggestion, $F(1, 27) = 5.70$, $p < .05$, $\eta^2 = .17$, and this was qualified by an Experience x Item x Suggestion interaction, $F(1, 27) = 6.80$, $p < .02$, $\eta^2 = .20$. The interaction occurred because children in the repeated-experience condition were highly accurate when responding to questions about fixed items. Specifically, planned comparisons showed that children in the repeated-experience condition were more accurate about fixed-true items (*M* = 7.77, *SD* = 0.44) than fixed-false (*M* = 6.85, *SD* = 0.80; $t[12] = 3.86$, $p < .01$) and variable-true items (*M* = 5.62, *SD* = 1.71, $t[12] = 4.07$, $p < .01$. Children in the single-experience condition were equally accurate about all four types of items, *ns*.

An identical analysis was run on the number of correct responses to recognition questions given by children in Study 2 (longer delay). There was a main effect of item, $F(1, 29) = 34.47$, $p < .01$, $\eta^2 = .46$, and this was qualified by an interaction with experience, $F(1, 29) = 28.05$, $p < .01$, $\eta^2 = .49$. Specifically, children in the repeated-experience condition were more accurate when answering questions about fixed items (*M* = 15.60, *SD* = 0.74) than variable items (*M* = 11.93, *SD* = 1.94), $t(14) = 7.72$, $p < .01$. As expected, however, there was no difference in responses to fixed and variable items by children in the single-experience condition (*M*s = 12.75, 12.88 and *SD*s = 1.53, 2.09 for the fixed and variable items, respectively), $t(15) < 1.00$, *ns*.

In summary, the expected superior memory for fixed compared to variable items after repeated experience was obtained at both short (Study 1) and long (Study 2) delays. Thus, analyses on the certainty ratings are valid.

Confidence questions

The certainty proportional scores for children in Study 1 (shorter delay) were entered into a 2 (Experience: single, repeated) x 2 (Item: fixed, variable) x 2 (Suggestion: true, false) ANOVA with the last two factors within-subjects. As expected, there was an interaction between item and experience, $F(1, 27) = 4.93$, $p < .05$, $\eta^2 = .16$ (see Figure 1). Planned comparisons showed that children in the repeated-experience condition were more confident in their memories of fixed items (*M* = .97, *SD* = .05) than were children in the single-experience condition (*M* = .84, *SD* = .25), $t(27) = -1.82$, $p < .05$. There was no difference in confidence, however, for memories of variable items depending on the amount of experience with the event (*M*s = .89 and *SD*s = .18, .25 for the repeated- and single-experience conditions, respectively). The main effect of suggestion fell just short of significance, $F(1, 27) = 4.13$, $p = .052$, $\eta^2 = .13$. The means indicated that children were more certain of their responses to true suggestions (*M* = .93, *SD* = .24) than false suggestions (*M* = .87, *SD* = .22).

An identical analysis was run on the certainty proportional scores of children in Study 2 (longer delay). The interaction between item and experience was not significant, but experience did interact with item and suggestion, $F(1, 29) = 5.02$, $p < .05$, $\eta^2 = .15$. Specifically, there was an Item x Suggestion interaction when responses from children in the repeated-experience condition were analysed, $F(1, 14) = 8.13$, $p < .02$, $\eta^2 = .37$. After repeated experience of the event, children were more confident of their responses to questions about fixed-true ($M = .95$, $SD = .18$) than variable-true items ($M = .86$, $SD = .20$). Children in the single-experience condition did not show such discrimination (see Figure 2).

Thus, the finding that children with repeated experience were highly confident of their memories of fixed details was replicated in two studies. As is customary for children this age, the confidence ratings were generally quite high. In spite of the high ratings, however, there were clear patterns of discrimination as a function of the amount of experience of the event, and the type of detail that children recalled.

Discussion

The confidence measurements from the two studies in the current investigation showed clearly that children who had experienced the event repeatedly were highly confident about their (accurate) responses to questions about fixed items from the target event, as suggested by Powell et al. (1999). Children with repeated experience showed discrimination between memories of fixed and variable items, even at long delays. In Study 1 (shorter delay), children in the repeated-experience condition were surer that they had accurately answered questions about fixed items than were children who answered the same questions but had only participated in the event one time. In Study 2 (longer delay), children with repeated experience of the event were surer about responses to fixed than variable items that were actually in the target event. These results show that children with repeated experience could metacognitively reflect on the accuracy of their memories for qualitatively different details and could discriminate appropriately between more and less accurate memories (i.e., memories of fixed versus variable items, respectively).

Importantly, as predicted, the children in the single-experience condition did not show such discrimination between the items, probably because their memory representations of 'fixed' and 'variable' items should have not have differed given that there was only one exposure to all items. Note that repetition did not simply induce a general confidence effect whereby children with repeated experience were overall more confident of their memories than were children in the single-experience conditions. Repetition increased confidence for fixed and not variable items in Study 1 (short delay), and children in the repeated-experience condition of Study 2 (longer delay) were not more confident overall than children in the single-experience condition. Thus, the increase in confidence after repeated experience of an event was specific to children's memories of fixed items.

It could be argued that the confidence question we used ("Did you see it or did you guess?") reflects children's vulnerability to social pressure, rather than their confidence that they actually saw given details. A social-pressure argument, however, cannot explain the differences that we found between confidence of children in the repeated- and single-experience groups, and the different levels of confidence in memories of fixed and variable details shown by children in the repeated-experience group. Presumably, children under intense social pressure would be more likely to claim that they were sure that they actually saw items that they had just testified were in the target event than children who felt less pressure. It is not clear why children with repeated experience (i.e., those who provided more 'I'm sure I saw' responses), would feel more social pressure than children who experienced the event just one time (and provided fewer 'I'm sure I saw' responses). The interviewer expressed knowledge to all children that she knew the children had participated in the event, and so all children should have been under similar social pressure. Similarly, children with repeated experience of the event should feel no more social pressure to say ‘sure’ rather than ‘guess’ for fixed versus variable items. There were clear differences, however, in the confidence the children expressed in their memories as a function of the amount of experience with the event and type of detail, thus ruling out social pressure as the main explanation for these findings.

The finding that children with repeated experience showed heightened confidence in the accuracy of their memories of fixed items after being misled is interesting from a developmental perspective. In general, children below the age of about 8 years do not discriminate on the basis of confidence between their correct and incorrect responses (e.g., Pressley et al., 1987; Roebers, 2002; Roebers & Howie, 2003). Yet the children in the current investigation were aged just 5-6 years and showed discrimination between items that were easy to remember (i.e., the fixed items) and items that were harder to remember (i.e., the variable items). It could be argued that discrimination between different kinds of items embedded in a series of occurrences is even more difficult than discriminating between correct and incorrect responses, thus, evidence of metacognitive awareness in 5-6 year-olds is a significant finding. Such differences between children’s memories of a single event (as used in previous research on confidence judgments) and children’s memories of a repeated event (as studied here) are fairly common, however. For example, children with repeated experience are more resistant to suggestions than children with a single event experience when the items are identical across a series of occurrences (see Roberts & Powell, 2001, for a review), and age differences are attenuated such that even young children can show heightened resistance to suggestions (Powell et al., 1999). Thus, the finding that the 5- to 6-year-olds in the current investigation showed metacognitive awareness of the accuracy of their memories for fixed items fits with the developing body of knowledge on children’s memories of repeated events, and suggests caution when generalizing from studies of children's memories of unique experiences.

Several researchers have argued that metacognitive awareness may be crucial in the success of procedures to enhance the accuracy of children's testimony (e.g., Giles et al., 2002; Ghetti, 2003; Roberts, 2002; Thierry & Spence, 2002). Metacognitive awareness may reduce suggestibility after misinformation procedures because children are better able to monitor the sources of their memories (i.e., determining if and when items were experienced or suggested). According to the source-monitoring framework (e.g., Johnson et al., 1993), effective source monitoring involves setting criteria to make attributions about memory sources. Such criteria can be influenced by biases, current goals, and metamemory assumptions. Setting criteria involves assigning weights to different kinds of retrieved information (e.g., assigning more weight to perceptual than cognitive operations information), assigning confidence to weighted information, and assigning overt responses to specific levels of confidence. Indeed, Koriat and Goldsmith (1996) showed that adults' ratings of confidence in the accuracy of their responses determined whether they reported or withheld responses to a general knowledge test when the need for accuracy was emphasized.

Could children's confidence ratings of their memories of repeated experiences after being misled be used to enhance the accuracy of their reports? The results of the current investigation suggest that the effectiveness of confidence ratings to boost accuracy will be partly determined by the delays at which reports are elicited. In Study 1 (shorter delay), when the memory and confidence ratings were elicited at the shorter 3-month delay, children with repeated experience of the event were more confident of their responses to false suggestions about fixed items than were children in the single-experience condition. As children with repeated experience were more resistant to these suggestions than children in the single-experience condition, the results show that confidence was associated with accurate responding to questions about fixed-false items. Thus, capitalizing on confidence ratings may help children with repeated experience resist false suggestions about fixed items. However, repetition did not enhance metacognitive monitoring of false suggestions about variable items. Suggestions about variable items are difficult to resist (Connolly & Lindsay, 2001; Powell & Roberts, 2002) and, thus, most in need of interventions to increase resistance. Perhaps older children would show more metacognitive discrimination of memories of variable items though previous research suggests that even older children often genuinely believe that they saw variable items in the target event when they were merely suggested (Powell & Roberts, 2002; Roberts & Powell, 2004).

In Study 2 (longer delay), when the memory interview took place 4½ months after the target event, repetition enhanced discrimination of responses to questions about fixed and variable items after being misled. Specifically, children in the repeated-experience condition were more confident that they had accurately responded to questions about fixed-true than variable-true items, and children in the single-experience condition did not show such discrimination. Enhanced discrimination was not observed when children with repeated experience judged the accuracy of their responses to questions about false items, however. Thus, using confidence ratings to set criteria for responding to questions after repeated experiences may aid accuracy when misinformation has been presented, children can remember the original items, and they are presented with the original items (e.g., recognition questions about true items). Confidence ratings may not aid accuracy at lengthy delays, however, under other conditions such as when recognition questions contain the misleading suggestions.

It is not possible from studies such as this and others (e.g., Roebers & Howie, 2003) to conclude that confidence was used to set criteria for accurate responding because the data are correlational. It could be that memory strength determined resistance to suggestions, for example, and an awareness of the strength of memory led to increased confidence in responses. However, these findings make an important contribution to the study of children's suggestibility because they provide crucial evidence to determine the conditions under which confidence is associated with accuracy of responding and at what ages such associations are present. Studies examining more direct evidence of the role of confidence judgments in the accuracy of reported information (e.g., training studies) are futile if there is no empirical evidence showing that children are metacognitively aware of the accuracy of memories across a variety of conditions. Drawing from research such as that reported here and in other studies (e.g., Roebers, 2002; Roebers & Howie, 2003), it may not be surprising that training children to more closely monitor the sources of their memories and thus resist suggestions appears to enhance the accuracy of older but not younger children. Poole and Lindsay, for example, trained children to retract (2001) or withhold (2002) false reports about science demonstrations. The training was most successful with children who were at least 7 years old (i.e., the lower age limit of metacognitive awareness; Pressley et al., 1987; Roebers, 2002), but 5- to 6-year-olds did benefit in part from the training procedures.

An investigation of children's confidence ratings in their correct and incorrect responses would be helpful in determining the value of such metacognitive awareness when resisting suggestions about a repeated event. As children's memories of fixed items are generally accurate, however, such an analysis is difficult because there are so few inaccurate responses for which children can provide confidence ratings. In sum, our findings suggest that studies to train children to improve their accuracy when they have experienced repeated events (by using confidence to set criteria for reporting) may be fruitful under certain conditions (i.e., at short delays, or at longer delays when the original items are presented).

The results have practical implications. Efforts to train children to monitor the accuracy of their memories in forensic interviews may profit from techniques that focus on children's confidence. Although the association between confidence and accuracy is typically modest at best (Wells, 1993), high associations are evidenced under certain conditions such as recall (Robinson & Johnson, 1996) and, as shown in the current study, when children with repeated experience are answering recognition questions after they have been exposed to misinformation. Second, the results can help clarify when jurors' reliance on witness confidence as an indicator of the accuracy of witness testimony is and is not appropriate. In conclusion, the results support Koriat's and Goldsmith's (1996) challenge to consider children's metamemorial processes at the same time as their memory processes to produce a more valid analysis of the factors that underlie the development of children's suggestibility.

References

Connolly, D.A., & Lindsay, D.S. (2001). The influence of suggestions on children's reports of a unique experience versus reporting of a repeated experience. *Applied Cognitive Psychology, 15*, 205-223.

Foley, M.A, Durso, F.T., Wilder, A., & Friedman, R. (1991). Developmental comparisons of explicit versus implicit imagery and reality monitoring. *Journal of Experimental Child Psychology, 51*, 1-13.

Ghetti, S. (2003). Memory for nonoccurrences: The role of metacognition. *Journal of Memory and Language, 48*, 722-739.

Giles, J.W., Gopnik, A., & Heyman, G.D. (2002). Source monitoring reduces the suggestibility of preschool children. *Psychological Science, 13*, 288-291.

Johnson, M.K., Foley, M.A., Suengas, A.G., & Raye, C.L. (1988). Phenomenal characteristics of memories for perceived and imagined autobiographical events. *Journal of Experimental Psychology: General, 117*, 371-376.

Johnson, M.K., Hashtroudi, S., & Lindsay, D.S. (1993). Source monitoring. *Psychological Bulletin, 114*, 3-28.

Koriat, A., Lichtenstein, S., & Fischhoff, B. (1980). Reasons for confidence. *Journal of Experimental Psychology: Human Learning & Memory, 6*, 107-118.

Koriat, A., & Goldsmith, M. (1996). Monitoring and control processes in the strategic regulation of memory accuracy. *Psychological Review, 103*, 490-517.

Lindsay, D.S. (1994). Memory source monitoring and eyewitness testimony. In D. F. Ross & J. D. Read & M. P. Toglia (Eds.), *Adult eyewitness testimony: Current trends and developments* (pp. 27-55). New York: Cambridge University Press.

Loftus, E.F., Donders, K., Hoffman, H.G., & Schooler, J.W. (1989). Creating new memories that are quickly accessed and confidently held. *Memory and Cognition, 17,* 607-616.

Marche, T.A. (1999). Memory strength affects reporting of misinformation. *Journal of Experimental Child Psychology, 73*(1), 45-71.

Penrod, S. & Cutler, B. (1995). Witness confidence and witness accuracy: Assessing their forensic relation. *Psychology, Public Policy, & Law, 1,* 817-845.

Poole, D.A., & Lindsay, D.S. (2001). Children's eyewitness reports after exposure to misinformation from parents. *Journal of Experimental Psychology: Applied, 7*, 27-50.

Poole, D.A., & Lindsay, D.S. (2002). Reducing child witnesses' false reports of misinformation from parents. *Journal of Experimental Child Psychology, 81*, 117-140.

Powell, M.B., Roberts, K.P., Ceci, S.J., & Hembrooke, H. (1999). The effects of repeated experience on children's suggestibility. *Developmental Psychology, 35*, 1462-1477.

Powell, M.B., Roberts, K.P., & Thomson, D.M. (2000). The effect of a suggestive interview on children's memory of a repeated event: Does it matter whether suggestions are linked to a particular incident? *Psychiatry, Psychology, & Law, 7*, 182-191.

Powell, M.B., & Roberts, K.P. (2002). The effect of repeated experience on children's suggestibility across two question types. *Applied Cognitive Psychology, 16,* 367-386.

Pressley, M., Levin, J.R., Ghatala, E.S., & Ahmad, M. (1987). Test monitoring in young grade school children. *Journal of Experimental Child Psychology, 43*, 96-111.

Roberts, K.P. (2002). Children's ability to distinguish between memories from multiple sources: Implications from the quality and accuracy of eyewitness statements. *Developmental Review. Special issue on forensic developmental psychology, 22*, 403-435.

Roberts, K.P., Lamb, M.E., & Sternberg, K.J. (1999). Effects of the timing of postevent information on preschoolers' memories of an event. *Applied Cognitive Psychology, 13*, 541-559.

Roberts, K.P., & Powell, M.B. (2001). Describing individual incident of sexual abuse: A review of research on the effects of multiple sources of information on children's reports. *Child Abuse & Neglect*, *25*, 1643-1659.

Roberts, K.P., & Powell, M.B. (2003) *The mediating roles of prior experience and the timing of misinformation on children's event memories.* Manuscript submitted for publication.

Roberts, K.P., & Powell, M.B. (2004, March). *Children's eyewitness memories of a single instance of a repeated event: The consistency effect.* Paper presented to the American Psychology-Law Society, Scottsdale, AZ.

Robinson, M.D., & Johnson, J.T. (1996). Recall memory, recognition memory, and the eyewitness confidence-accuracy relation. *Journal of Applied Psychology, 81,* 587-594.

Robinson, M.D., Johnson, J.T., & Robertson, D.A. (2000). Process versus content in eyewitness metamemory monitoring. *Journal of Experimental Psychology: Applied, 6,* 207-221

Roebers, C.M. (2002). Confidence judgements in children's and adults' event recall and suggestibility. *Developmental Psychology, 38,* 1052-1067.

Roebers, C.M., & Howie, P. (in press). Confidence judgments in event recall: Developmental progression in the impact of question format. *Journal of Experimental Child Psychology.*

Sporer, S.L., Penrod, S. Read, D., & Cutler, B. (1995). Choosing, confidence, and accuracy: A meta-analysis of the confidence-accuracy relation in eyewitness identification studies. *Psychological Bulletin, 118,* 315-327.

Thierry, K.L., & Spence, M.J. (2002). Source-monitoring training facilitates preschoolers' eyewitness memory performance. *Developmental Psychology*, *38*, 428-437.

Wells, G.L. (1993). What do we know about eyewitness identification? *American Psychologist*, *48*, 553-571.

Figure 1

The effects of experience on confidence ratings in Study 1 (shorter delay).

Figure 2

The effects of experience on confidence ratings in Study 2 (longer delay).

Figure 1

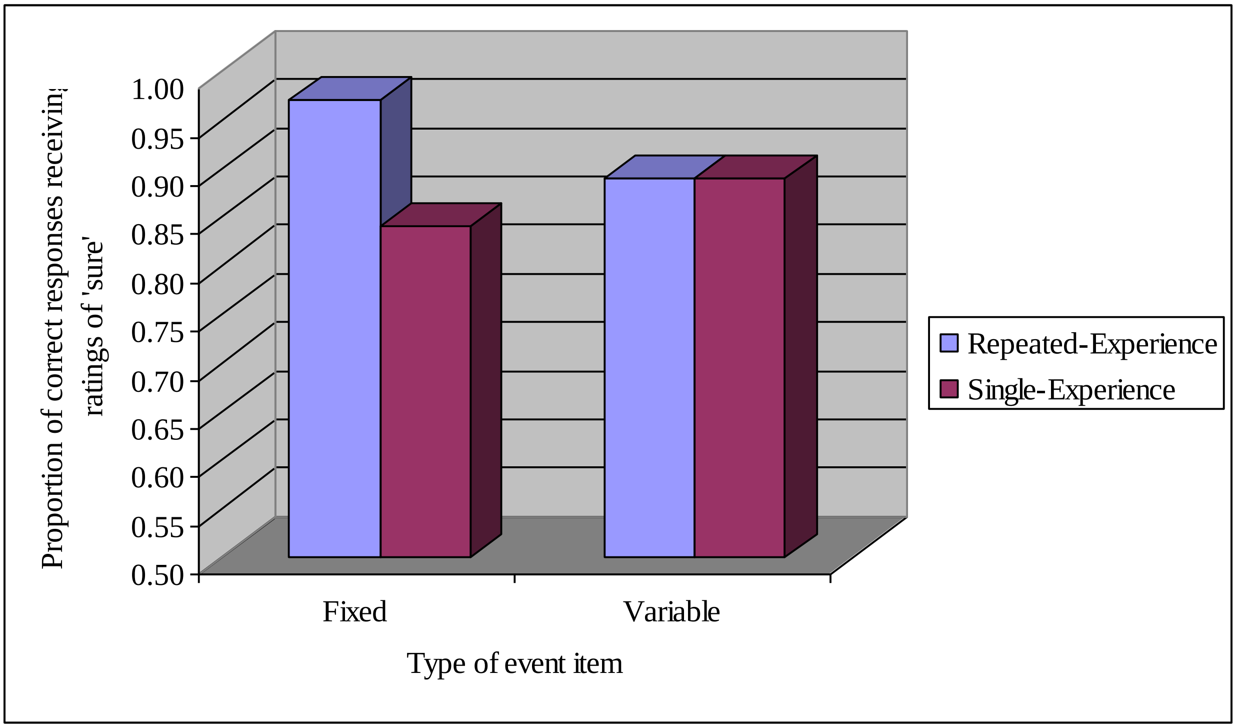
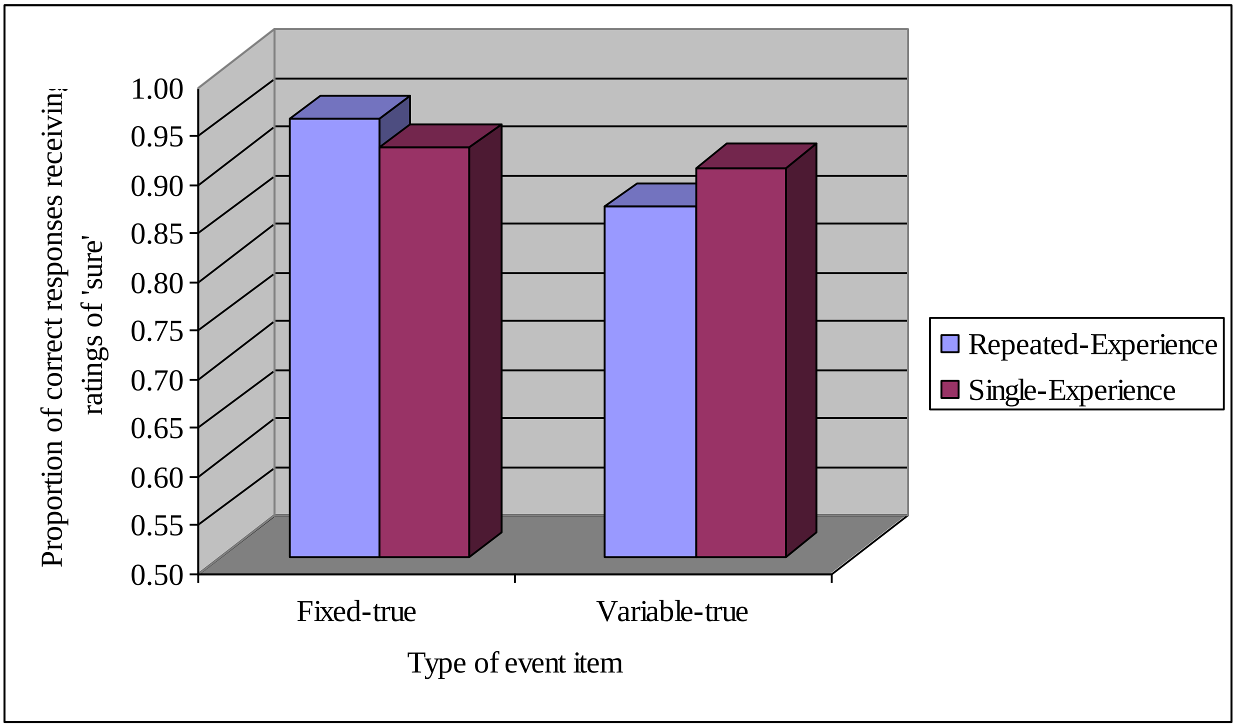

Proportion of correct responses receiving ratings of 'sure'
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
Fixed
Variable
Type of event item
Repeated-Experience
Single-Experience

Figure 2


Proportion of correct responses receiving ratings of 'sure'
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0.60
0.55
0.50
Fixed-true
Variable-true
Type of event item
Repeated-Experience
Single-Experience